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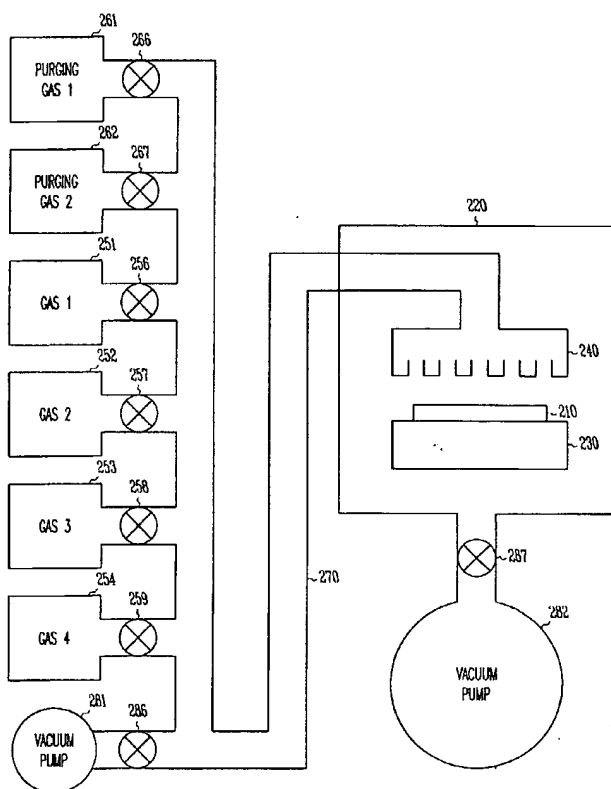
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(54) Title: ATOMIC LAYER DEPOSITED DIELECTRIC LAYERS



(57) Abstract: An atomic layer deposited dielectric layer and a method of fabricating such a dielectric layer produce a reliable dielectric layer having an equivalent oxide thickness thinner than attainable using SiO<sub>2</sub>. Depositing a hafnium metal layer on a substrate surface by atomic layer deposition and depositing a hafnium oxide layer on the hafnium metal layer by atomic layer deposition form a hafnium oxide dielectric layer substantially free of silicon oxide. Dielectric layers containing atomic layer deposited hafnium oxide are thermodynamically stable such that the hafnium oxide will have minimal reactions with a silicon substrate or other structures during processing.



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## B. FIELDS SEARCHED

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Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, PAJ

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6 518 634 B1 (KAUSHIK VIDYA S ET AL) 11 February 2003 (2003-02-11)  column 1, line 13 - line 36 column 2, line 13 - line 48; figures 1,2 column 2, line 57 - column 3, line 3; figure 3 column 3, line 4 - line 14 column 3, line 22 - line 48; claims 1,3,4; figure 4	1-4,12, 13,21, 22,55,59
Y		5-11, 14-20, 23-54, 56-58, 60-73
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Patent family members are listed in annex.

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## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	YAMAMOTO KAZUHIKO ET AL: "Effect of Hf metal predeposition on the properties of sputtered HfO <sub>2</sub> /Hf stacked gate dielectrics" APPLIED PHYSICS LETTERS, AMERICAN INSTITUTE OF PHYSICS. NEW YORK, US, vol. 81, no. 11, 9 September 2002 (2002-09-09), pages 2053-2055, XP012031905 ISSN: 0003-6951 page 2053; figure 1 page 2054, left-hand column; figure 2 page 2055	55-62
Y		12-47,
A		63-73
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X	US 6 420 279 B1 (ONO YOSHI ET AL) 16 July 2002 (2002-07-16) column 1, line 7 - line 67 column 2, line 36 - line 47 column 3, line 13 - line 67; claims 1-5	55-58
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A		1-4
X		1-4,12,
Y		13,55
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## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	HOSHINO Y ET AL: "Characterization and control of the HfO <sub>2</sub> /Hf/Si (001) interfaces" APPLIED PHYSICS LETTERS, AMERICAN INSTITUTE OF PHYSICS. NEW YORK, US, vol. 81, no. 14, 30 September 2002 (2002-09-30), pages 2650-2652, XP012032094 ISSN: 0003-6951 the whole document	55-62
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